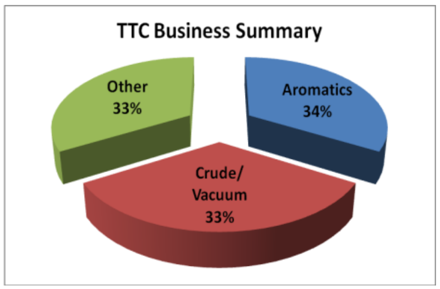
Major Businesses

TTC is an engineering consulting firm in the petrochemicals and refining industries. The major businesses of TTC are:

- Revamps



- Operator Training Courses
    - Aromatics Extraction
    - Crude/Vacuum
    - Hydrotreating
    - Reforming
    - Adsorption
    - Isomerization

- Profit Programs

	Target, $/bbl
No investment	0.25
<2 year payback	1.00

- Troubleshooting
    - World-Class Experts
    - Onsite & Remote
    - Engineer Training Courses

Based in the U.S.A., about 30% of TTC's work is in Europe and the Middle East, 30% is in Asia and 40% is domestic.

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TTC, Labs, Inc

Overview

Process Engineering Excellence.

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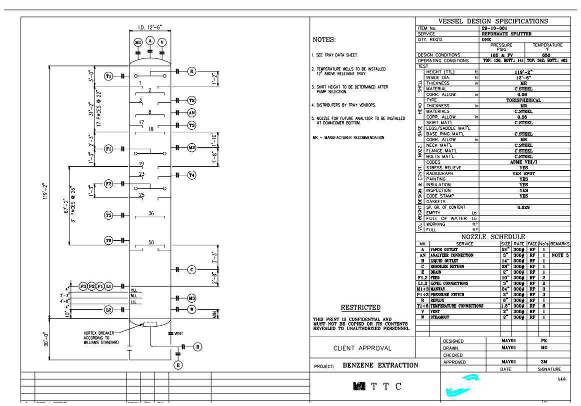
Revamps

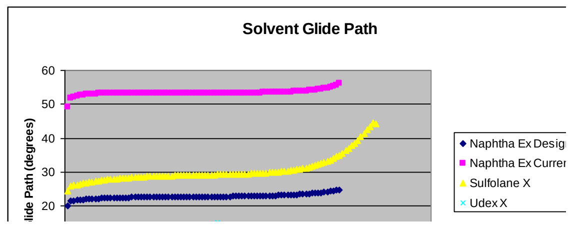
As with all services, engineering teams are centered around process engineers with 30+ years experience. Processes include:

- Crude/Vacuum
- Hydrotreating
- Reforming
- FCC
- Hydrocracking
- BTX Extraction & Extractive Distillation
- PX Adsorption & Crystallization
- C4/C5/C6 & Xylene Isomerization
- Other refining & petrochemical processes

For revamps, the transfer rates for mass, components and energy are calibrated from operating data. For reactors, the heats of reaction from heats of formation are compared to operating data. For distillations, sufficient pseudo-components are used to match the entire laboratory curves. For piping, pumps, compressors, exchangers and control valves, the detailed hydraulics are built into the rigorous simulation.



US Aromatics Plant Vessel Sketch



Sample tray rating profile

Typical Scope

The focus is always on thoroughness and profitability.

For profits, one goal in each revamps is to generate enough money saving ideas to be cash neutral before the project is completed. The ideas range from changing cascade schemes to correcting vectors in the LP.

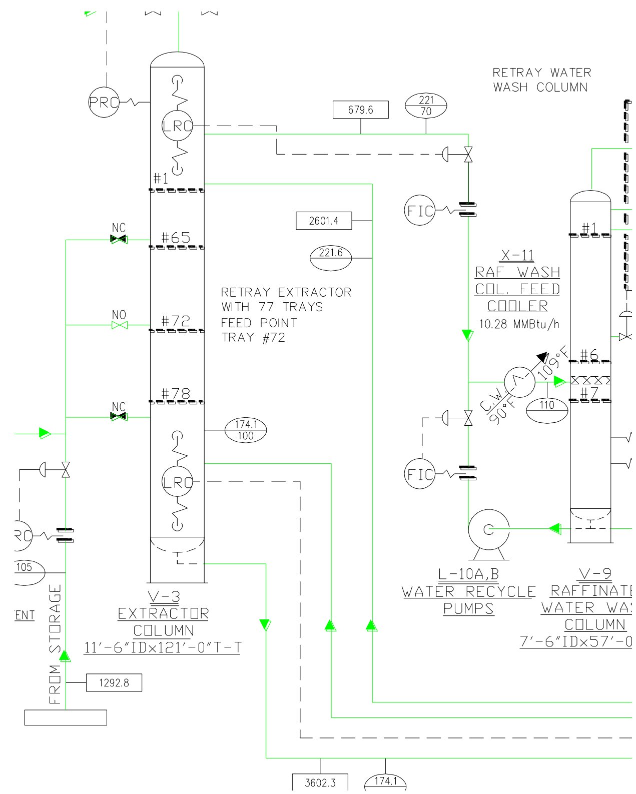
TTC simulation reports include:

- Stream compositions, bulk properties and distillations
- Reactor inlet and outlet compositions
- Tray-to-tray rates and compositions
- Hydraulics with control valve positions
- Rigorous ratings for each piece of equipment

During the work, TTC finds ways to:

- Fix problems that lead to low tray efficiencies
- Exploit surface areas in exchangers
- De-couple cascade loops
- Check safety valves and relief loads with dynamic simulations

Along with the simulation reports, TTC provides annotated PFD's, P&ID's, equipment lists, line lists, training manuals and more. For the P&ID's, all start-up and off-spec lines are included. For documentation, designer notes and operating procedures are included.



Sample Annotated PFD.